

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-41

Name: East Vermillion Lake

County: McCook

Legal Description: T102N-R53W-Sec. 14-15, 22-23, 26-27, 33-35

Location from nearest town: 5 miles east, 1 mile south of Canistota, SD

Dates of present survey: July 15-17, 2008 (netting); October 7, 2008 (electrofishing)

Dates of last survey: July 16-18, 2007 (netting); September 26, 2007 (electrofishing)

Primary Game Species	Other Species
Walleye	Largemouth Bass
Black Crappie	Yellow Perch
Bluegill	White Crappie
	Northern Pike
	Channel Catfish
	Common Carp
	White Sucker
	Black Bullhead

PHYSICAL DATA

Surface area: 513 acres

Maximum depth: 23 feet

Volume: 6,600 acre feet

Contour map available? Yes

Lake elevation observed during the survey: Full

Beneficial use classification: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Watershed area: 264,789 acres

Mean depth: 12 feet

Shoreline length: 10.1 miles

Date prepared: 1974

Introduction

East Lake Vermillion, commonly known as Lake Vermillion, is an impoundment formed by a dam constructed across the East Vermillion River in 1958. Battle Creek is a secondary tributary that forms the west arm of the lake. A low-level outlet gate can be opened for flood control purposes. In April and July 1993, the primary and secondary spillways suffered significant damage during flood events. In March 1994, the primary spillway was undermined and collapsed due to the previous year's damage. The primary spillway was repaired by spring 1995.

Ownership of Lake and Adjacent Lakeshore Properties

East Vermillion Lake is owned and managed by the Parks and Wildlife Divisions of the South Dakota Department of Game, Fish and Parks (GFP). Together, the two divisions own 1,826 acres which includes the surface area of the lake. Public use easements grant the public the right to access and use a strip of land 50 feet wide outside the high water contour of the lake.

Fishing Access

The West Recreation Area, a fee area managed by the Parks Division, has a double lane boat ramp with a dock, public toilet, handicapped fishing dock, modern campground, fish cleaning station, swimming beach, and shore fishing access. There is vehicle access to shore-fishing areas in the western arm of the lake. The East Recreation Area, also a fee area managed by the Parks Division, has a double lane boat ramp with a dock, public toilet, campground, and shore fishing access.

Field Observations of Water Quality and Aquatic Vegetation

Scattered beds of sago pondweed (*Potamogeton pectinatus*) were common throughout the lake. Cattails (*Typha spp.*) and duckweed (*Lemna spp.*) were also observed. The water was fairly clear with a Secchi depth measurement of 71 cm (28 in).

BIOLOGICAL DATA

Methods:

East Vermillion Lake was sampled on July 15-17, 2008 with four overnight gill-net sets and ten overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. One hour and forty minutes of nighttime electrofishing was done on October 7, 2008 to evaluate walleye recruitment. Sampling locations are displayed in Figure 5.

Gill Net Catch

Black bullheads comprised 69.4% of the gill net catch this year (Table 1). Other species sampled included yellow perch, walleye, white sucker, channel catfish, common carp, northern pike, and black crappie.

Table 1. Total catch from four overnight gill net sets at East Vermillion Lake, McCook County, July 15-17, 2008.

Species	No.	%	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	347	69.4	86.8	±18.6	117.0	86	0	105
Yellow Perch	46	9.2	11.5	±7.6	19.6	89	7	108
Walleye	40	8.0	10.0	±3.6	13.5	0	0	89
White Sucker	40	8.0	10.0	±4.5	4.8	100	80	112
Channel Catfish	15	3.0	3.8	±1.0	2.5	64	29	105
Common Carp	8	1.6	2.0	±2.6	1.0	--	--	--
Northern Pike	3	0.6	0.8	±1.0	1.7	--	--	--
Black Crappie	1	0.2	0.3	±0.3	1.1	--	--	--

* 10 years (1998-2007)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Black bullheads were also the most abundant species sampled in the trap nets (Table 2). Ten additional species were also sampled.

Table 2. Total catch from ten overnight trap net sets at East Vermillion Lake, McCook County, July 15-17, 2008.

Species	No.	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	789	79.7	78.9	±24.1	645.7	83	0	94
Common Carp	75	7.6	7.5	±4.2	4.3	95	3	94
Bluegill	36	3.6	3.6	±2.1	12.1	97	69	114
Channel Catfish	27	2.7	2.7	±1.5	2.9	16	8	93
White Sucker	25	2.5	2.5	±1.0	2.4	100	88	103
Walleye	22	2.2	2.2	±1.1	1.4	7	0	90
Northern Pike	10	1.0	1.0	±0.7	2.7	70	20	86
Black Crappie	3	0.3	0.3	±0.3	6.4	--	--	--
Yellow Perch	1	0.1	0.1	±0.1	1.8	--	--	--
Freshwater Drum	1	0.1	0.1	±0.1	0.03	--	--	--
Green Sunfish	1	0.1	0.1	±0.1	0.1	--	--	--

* 10 years (1998-2007)

Walleye

Management objective: Maintain a walleye fishery with a gill-net CPUE of at least 15 and PSD range of 30-60.

Walleye gill-net CPUE was surprisingly low based on the very high electrofishing catch of yearling walleyes in fall 2007 (Table 3). Electrofishing in 2008 again showed a high abundance (35/h) of these fish suggesting that they may not be fully recruited to the gill nets because of their slow growth and small size (mean length of only 25 cm or 10 inches). Overall, growth of age-1-3 walleyes sampled in summer gill nets was slower than other years and other lakes in the region (Table 4).

Fall electrofishing also indicated that a moderate year class was naturally produced in 2008 (Table 5). Large walleyes were observed during fall electrofishing, but none were sampled during summer gill-netting.

Table 3. Walleye gill net CPUE, PSD, RSD-P and mean Wr in East Vermillion Lake, McCook County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE	17.5	9.2	14.5	17.5	8.3	4.8	9.8	17.8	8.8	10.0	13.5
PSD	50	31	42	53	78	89	50	60	59	0	55
RSD-P	4	3	7	8	25	28	15	4	15	0	12
Mean Wr	87	87	83	91	90	88	92	98	86	89	89

*10 years (1998-2007)

Table 4. Weighted mean length at capture (mm) for walleye captured in gill nets in Brant Lake, Lake County, 2003-2008. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size in parentheses.

Year	1	2	3	4	5	6	7	8	9	10	11	12
2008 (40)	216 (2)	290 (37)	372 (1)	--	--	--	--	--	--	--	--	--
2007 (35)	270 (6)	323 (5)	387 (5)	392 (5)	461 (2)	446 (2)	468 (3)	518 (3)	552 (1)	629 (2)	478 (1)	--
2006 (71)	229 (18)	325 (19)	418 (20)	--	448 (5)	457 (5)	510 (3)	--	531 (1)	--	--	--
2005 (34)	288 (10)	369 (9)	--	440 (8)	467 (2)	522 (3)	596 (1)	641 (1)	--	--	--	--
2004 (19)	249 (3)	--	391 (2)	461 (6)	505 (4)	557 (1)	505 (1)	613 (2)	--	--	--	--
2003 (32)	--	299 (4)	400 (10)	446 (7)	486 (4)	535 (3)	587 (2)	626 (2)	--	--	--	--

Table 5. Age-0 and age-1 walleyes sampled during 1 hour and forty minutes of nighttime electrofishing on East Vermillion Lake, McCook County, 2000-2008.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2008	none	35	13-57		188 (170-215)	98	2	0-5	226 (226-226)	83
2007	none	23	8-38		151 (131-151)	75	156	78-234	221 (171-262)	81
2006	fingerling	326	213-439	8	144 (116-205)	85	2	0-6	254 (212-268)	92
2005	none	39	27-51		201 (152-230)	98	3	1-5	228 (220-230)	93
2004	none	44	34-54		193 (154-215)	86	1	0-2	303 (290-315)	86
2003	none	84	60-108		178 (134-209)	97	1	0-2	272 (255-286)	87
2002	none	7	2-12		169 (161-185)	96	196	138-254	271 (224-315)	89
2001	none	202	136-268		169 (129-216)	94	43	28-57	296 (245-330)	91
2000	none	231	117-345		200 (150-228)	103				

Black Crappie

Management objective: Maintain a black crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

Black crappie trap-net CPUE remains low due to several years of poor recruitment (Table 6). Our management objective for CPUE has been achieved only four times since 1990. Black crappies have not been stocked in East Vermillion Lake since 1996 (Table 10).

Table 6. Black crappie trap-net CPUE, PSD, and mean Wr in East Vermillion Lake, McCook County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE	9.6	10.4	20.9	14.5	2.2	0.5	0.3	1.1	0.9	0.3	6.4
PSD	6	99	23	93	95	--	--	--	--	--	69
RSD-P	2	5	19	2	15	--	--	--	--	--	19
Mean Wr	135	118	167	119	107	--	--	--	--	--	127

*10 years (1998-2007)

Bluegill

Management objective: Maintain a bluegill fishery with a trap net CPUE of at least 20 and RSD-18 of at least 20.

In 2008, bluegill trap-net CPUE increased slightly (Table 7). The management objective of 20 per net has only been reached twice since 1990. The bluegills sampled ranged in length from 90-250 mm (3.5-10 in) (Figure 3) and their condition is excellent (Table 10, Mean Wr=114).

Table 7. Bluegill trap-net CPUE, PSD, RSD-18, RSD-P, and mean Wr in East Vermillion Lake, McCook County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE	11.5	2.9	9.2	21.0	41.1	14.7	6.6	4.9	2.5	3.6	12.1
PSD	80	74	13	100	100	100	100	44	96	97	80
RSD-18	78	43	2	63	98	99	100	33	32	94	63
RSD-P	41	35	1	51	55	78	97	33	28	69	48
Mean Wr	131	141	138	128	112	110	115	131	122	114	125

*10 years (1998-2007)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of less than 100.

Black bullhead CPUE dropped below 100 for only the third time since 1990 (Table 8). Over 83% of the bullheads sampled were more than 23 cm (9 inches) (Table 8 and Figure 4). Age-0 black bullheads were observed during the survey possibly indicating production of a strong year class. A GFP-subsidized commercial fisherman has removed approximately 25,000 pounds (50 pounds/acre) of bullheads each of the last seven years in an attempt to control the population.

Table 8. Black bullhead trap-net CPUE and PSD for East Vermillion Lake, McCook County, 1999-2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Mean*
CPUE	112.9	107.6	291.8	190.2	473.1	1,574.0	258.8	2,718.8	534.1	78.9	645.7
PSD	78	89	30	58	27	19	91	2	2	83	49
RSD-P	5	13	9	7	1	0	0	0	0	0	4
Mean Wr	94	90	100	102	98	93	93	89	90	94	97
Mean Length mm			171	223	216	213	244	157	196	221	203

*10 years (1998-2007)

All Species

CPUE for all species was within previously observed ranges (Table 9). Age-0 freshwater drum and largemouth bass were observed during fall electrofishing.

Table 9. Gill-net (GN), electrofishing (EF) and trap-net (TN) CPUE for all fish species sampled in East Vermillion Lake, McCook County, 1999-2008.

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
COC (GN)	0.2	0.2	1.2	0.5	0.3	0.3	0.8	3.0	3.8	2.0
COC (TN)	2.5	4.4	1.5	6.4	1.2	1.4	6.3	2.3	8.2	7.5
WHS (GN)	4.2	9.0	5.7	0.7	4.5	2.8	4.5	3.0	8.3	10.0
WHS (TN)	1.8	9.2	1.4	4.4	0.8	0.1	1.7	2.1	1.6	2.5
BLB (GN)	50.5	59.5	70.5	146.5	233.3	169.5	124.0	174.5	98.8	86.8
BLB (TN)	112.9	107.6	291.8	190.2	473.1	1574	258.8	2718.8	534.1	78.9
CCF (GN)	0.2	0.7	0.2	0.7	3.5	1.5	5.0	10.8	2.8	3.8
CCF (TN)	0.3	0.7	0.2	0.2	4.7	9.2	6.6	3.1	3.1	2.7
NOP (GN)	6.0	2.5	1.0	2.5	--	0.3	0.8	--	0.5	0.8
NOP (TN)	2.0	5.0	1.6	8.6	1.3	1.2	0.6	1.3	0.2	1.0
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	--	--	--	0.1	--	--	--	0.3	0.1	0.1
BLG (GN)	--	--	0.5	1.2	--	0.5	--	--	--	--
BLG (TN)	11.5	2.9	9.2	21.0	41.1	14.7	6.6	4.9	2.5	3.6
HYB (GN)	--	--	--	--	--	--	--	--	--	--
HYB (TN)	0.1	--	--	0.2	0.1	--	--	--	--	--
SMB (GN)	--	--	--	--	--	--	--	--	--	--
SMB (TN)	--	0.4	--	--	--	--	--	--	--	--
LMB (EF)	--	--	--	--	--	5.5	--	3.5	--	--
LMB (TN)	--	0.1	--	0.5	0.1	0.3	0.3	0.3	--	--
WHC (GN)	0.7	0.2	2.7	2.5	--	0.3	0.3	0.3	--	--
WHC (TN)	0.4	0.4	4.4	6.4	1.3	1.2	0.3	--	0.2	--
BLC (GN)	2.5	1.0	1.7	3.2	0.8	0.3	--	0.3	--	0.3
BLC (TN)	9.6	10.4	20.9	14.5	2.2	0.5	0.3	1.1	0.9	0.3
YEP (GN)	22.2	8.0	47.2	42.5	28.8	21.3	8.8	6.3	7.3	11.5
YEP (TN)	2.2	1.5	4.0	4.7	1.6	0.6	0.4	1.5	0.7	0.1
WAE (GN)	17.5	9.2	14.5	17.5	8.3	4.8	9.8	17.8	8.8	10.0
WAE (TN)	0.5	1.6	1.4	3.9	2.1	1.3	0.3	0.1	2.2	2.2
FRD (GN)	--	--	--	--	--	--	--	0.3	--	--
FRD (TN)	--	--	--	--	--	--	--	--	--	0.1

COC (Common Carp), WHS (White Sucker), BLB (Black Bullhead), CCF (Channel Catfish), NOP (Northern Pike), GSF (Green Sunfish), BLG (Bluegill), HYB (Hybrid Sunfish), SMB (Smallmouth Bass), LMB (Largemouth Bass), WHC (White Crappie), BLC (Black Crappie), YEP (Yellow Perch), WAE (Walleye), FRD (Freshwater Drum)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor East Vermillion Lake with annual summer netting surveys to sample adult fish populations and fall electrofishing surveys to monitor walleye recruitment.
2. Discontinue biennial electrofishing efforts to sample largemouth bass. There is little potential to increase bass density at this time.
3. Develop a habitat improvement plan for East Vermillion Lake that may include periodic drawdowns, artificial structures, rock spawning reefs and fishing piers.
4. Investigate potential reasons for the poor crappie and bluegill recruitment in recent years.

Table 10. Stocking record for East Vermillion Lake, McCook County, 1991-2008.

Year	Number	Species	Size
1991	6,700	Walleye	Sml. Fingerling
	6,000	Walleye	Lrg. Fingerling
1992	15,000	Largemouth Bass	Sml. Fingerling
	40,690	Largemouth Bass	Med. Fingerling
	12,824	Walleye	Lrg. Fingerling
	902	Walleye	Juvenile
	109	Walleye	Adult
	38,930	Yellow Perch	Fingerling
1995	1,350	Black Crappie	Adult
	27,500	Channel Catfish	Fingerling
	35,700	Fathead Minnow	Adult
	55,000	Walleye	Sml. Fingerling
	3,789	Black Crappie	Adult
1996	51,300	Bluegill	Fingerling
	51,300	Channel Catfish	Fingerling
	5,227	Yellow Perch	Fingerling
	102,600	Walleye	Fingerling
1999	51,300	Walleye	Fingerling
2005	16,544	Walleye	Fingerling
2006	51,425	Walleye	Fingerling

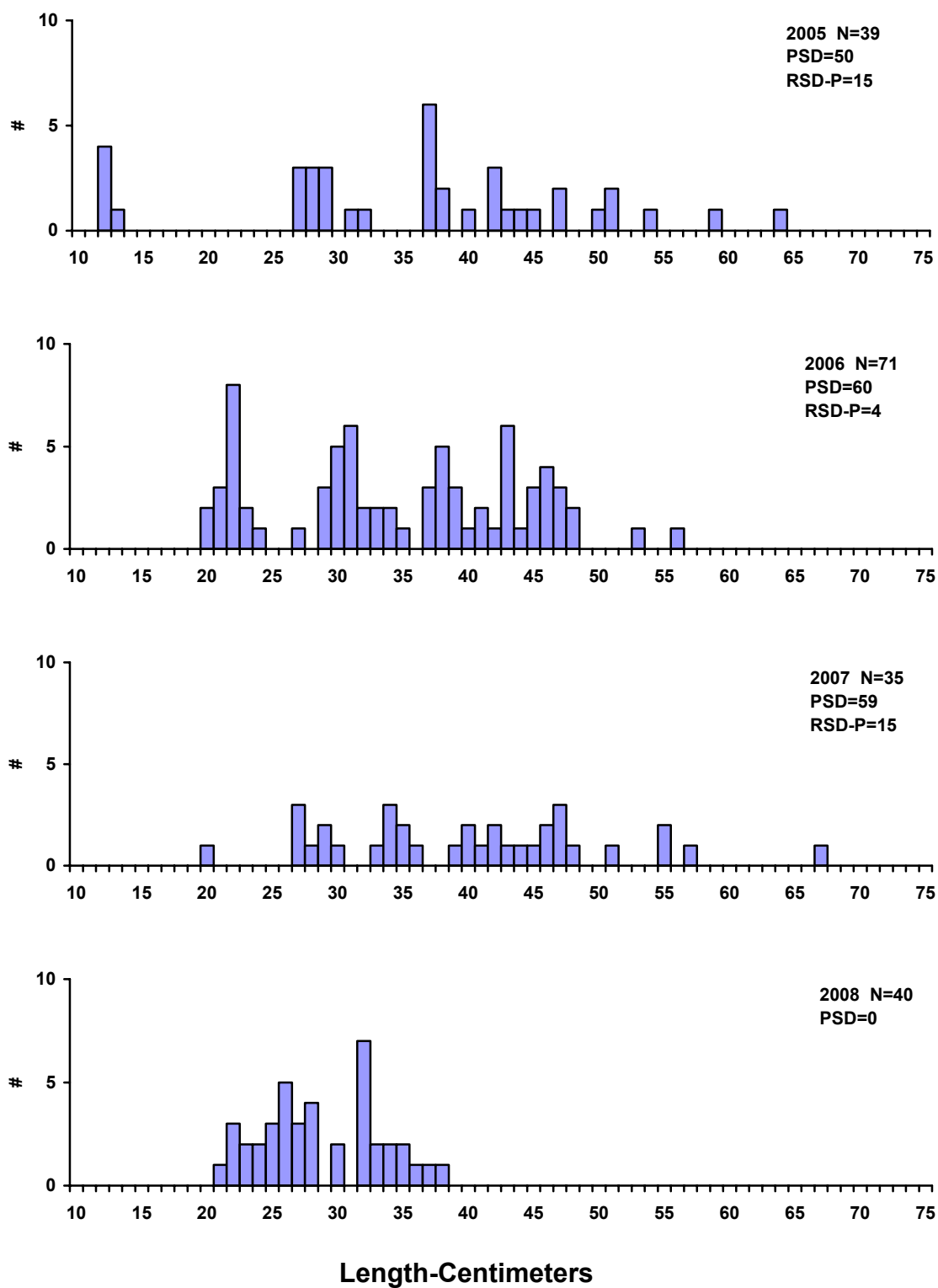


Figure 1. Length frequency histograms for walleye sampled with gill nets in East Vermillion Lake, McCook County, 2005-2008.

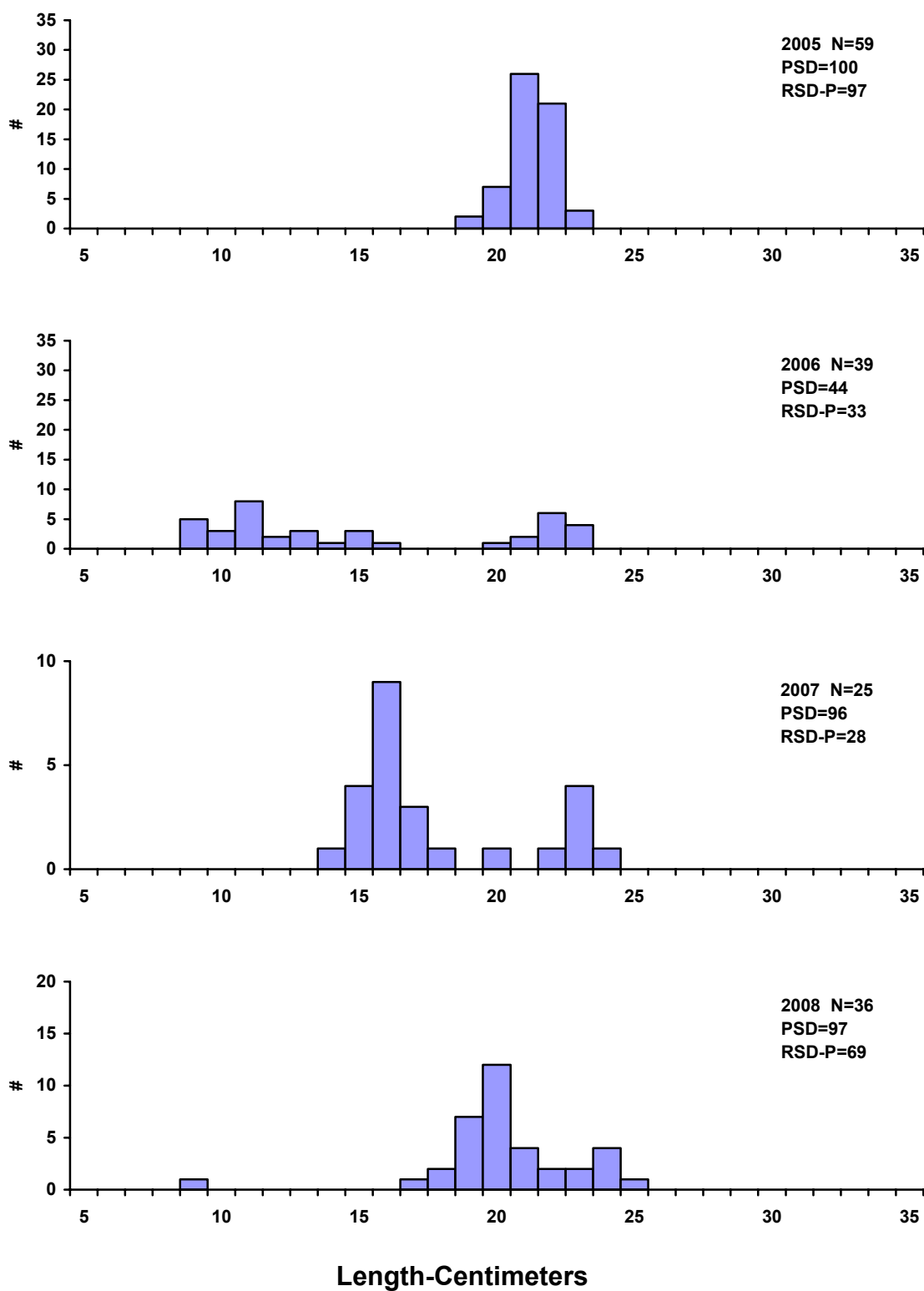


Figure 3. Length frequency histograms for bluegills sampled with trap nets in East Vermillion Lake, McCook County, 2005-2008.

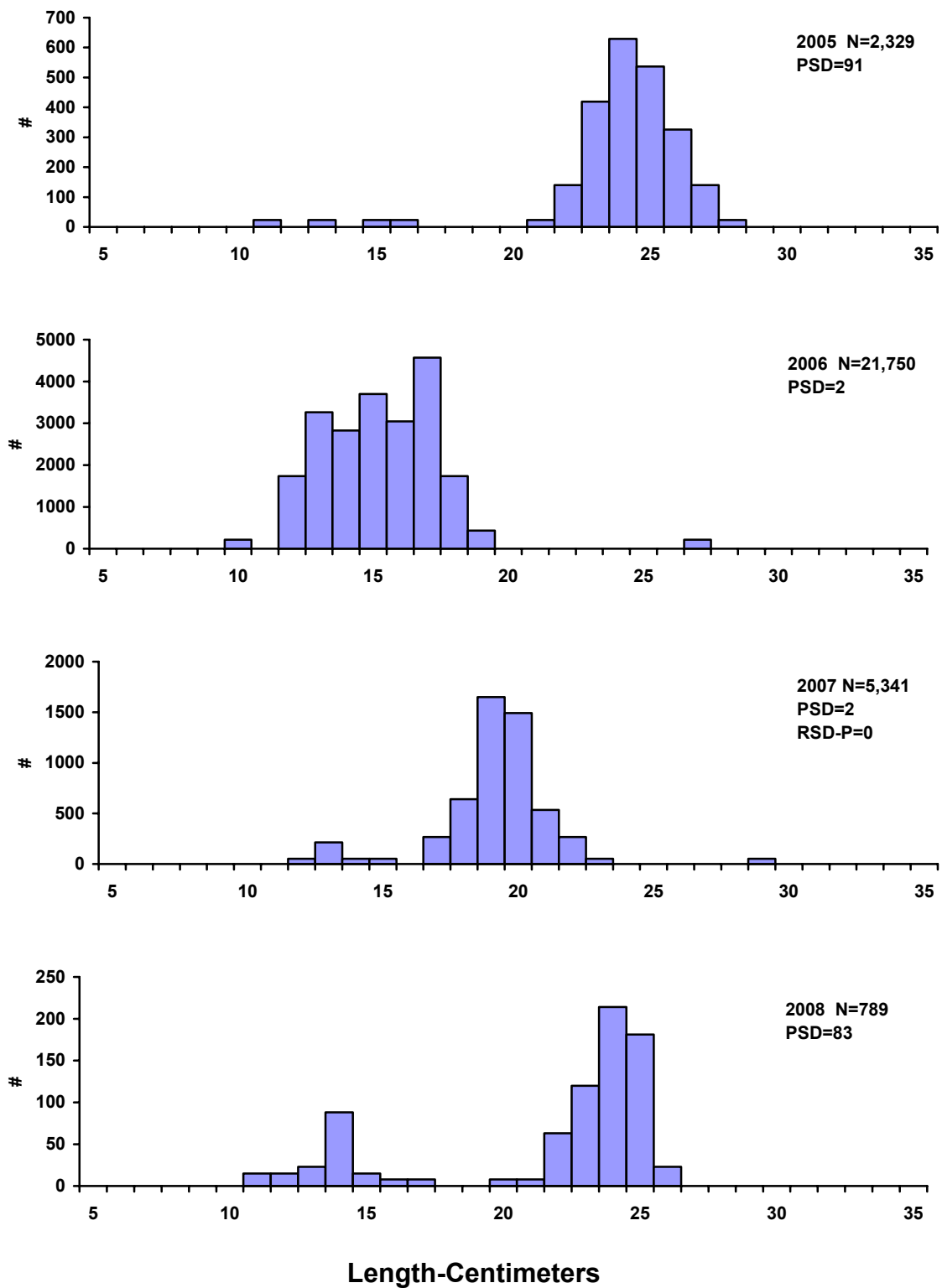


Figure 4. Length frequency histograms for black bullheads sampled with trap nets in East Vermillion Lake, McCook County, 2005-2008.

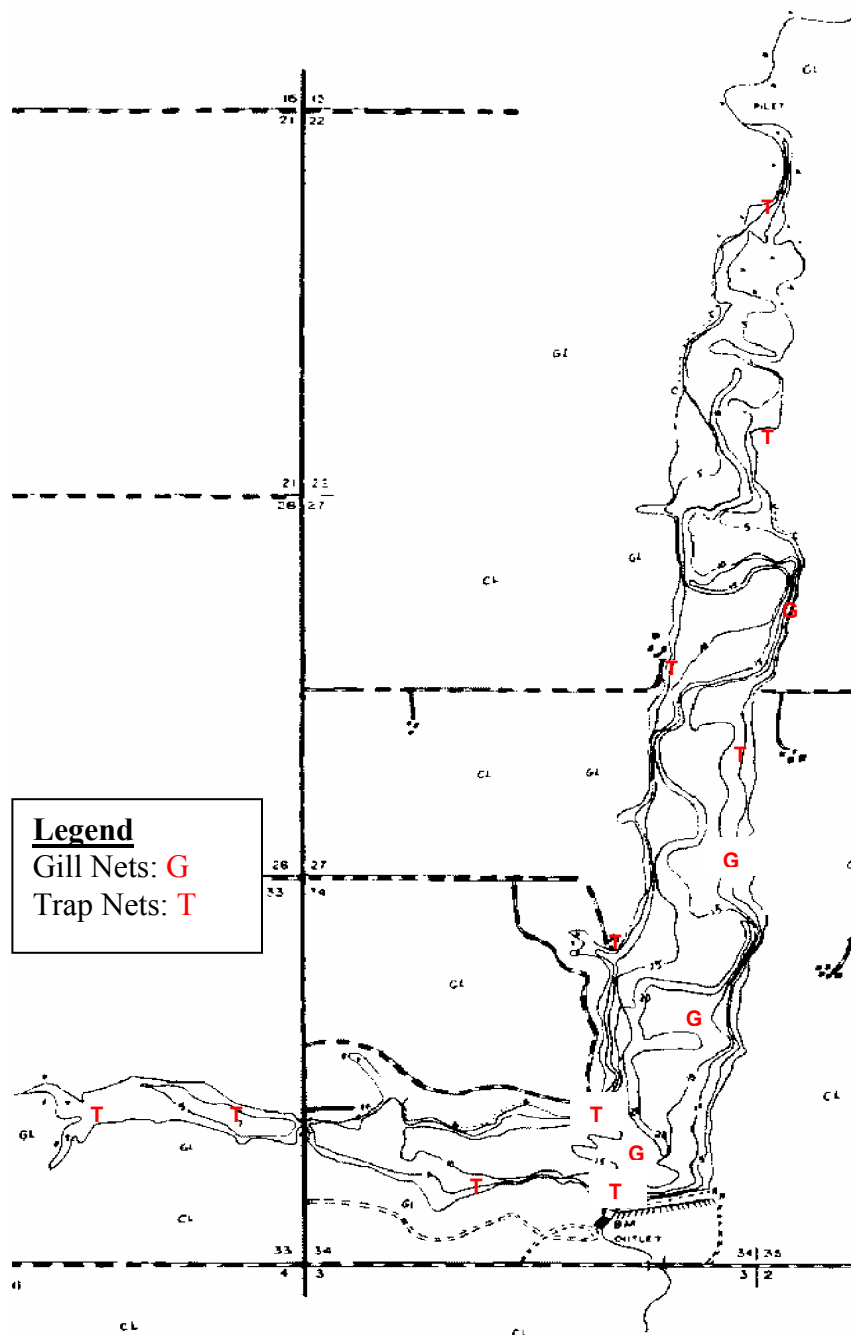


Figure 5. Sampling locations on East Vermillion, McCook County, 2008.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.